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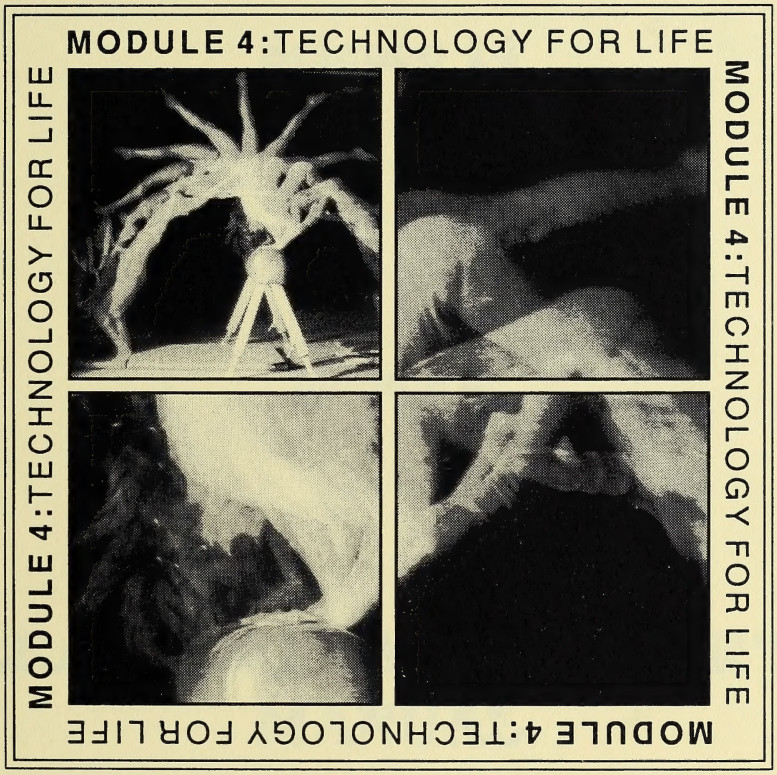
# SCIENCE 14




## Learning Facilitator's Manual

Distance Learning

Alberta EDUCATION

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# Science 14

## Module 4

# LEARNING FACILITATOR'S MANUAL

Alberta
EDUCATION

## Note

**This Science Learning Facilitator's Manual contains answers to teacher-assessed assignments; therefore, it should be kept secure by the teacher. Students should not have access to these assignments until they are assigned in a supervised situation. The answers should be stored securely by the teacher at all times.**

Science 14
Learning Facilitator's Manual
Module 4
Technology For Life
Alberta Distance Learning Centre
ISBN No. 0-7741-0443-0

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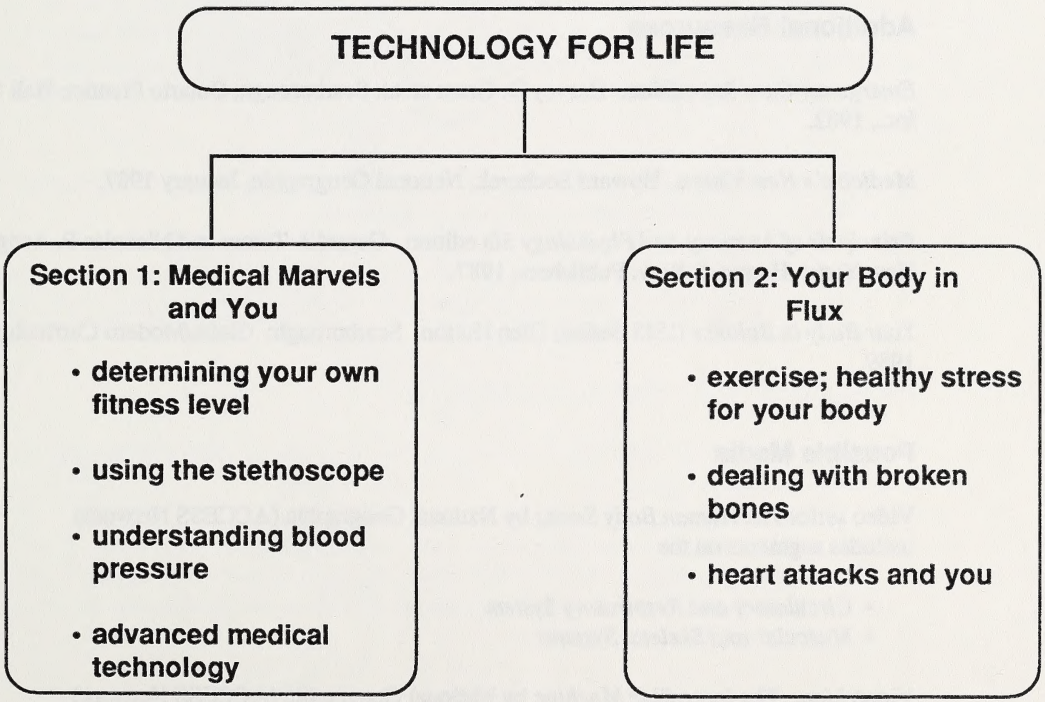
# Module 4 – Technology For Life: Overview

The emphasis of this module is on the diagnostic technology which has been developed by society to monitor and evaluate the fitness of body systems. This technology can be as simple as a stethoscope or as complex as a Computerized Axial Tomography Scanner. Students are asked to perform various investigations which attempt to evaluate their own level of fitness. The effects of external stress are also discussed, along with the failure of a body system. This module specifically examines failures in the skeletal and circulatory systems; fractures and heart attacks. The technology for treating fractures and heart attacks is also examined. A trip to a hospital or medical labratory would be a good way to introduce this module.

The only equipment needed for the investigations is a watch with a sweep second hand and a stethoscope. You may also wish to obtain a sphygmomanometer and determine blood pressure readings for each of your students. Answers are provided for most exercises in the appendix of the module booklet. The only exceptions are the enrichment activities, in which the student is asked to do independent research to investigate topics of interest. Students should submit their enrichment activities to their learning facilitator for confirmation of the assignment.


TECHNOLOGY FOR LIFE
Section 1: Medical Marvels and You
• determining your own fitness level
• using the stethoscope
• understanding blood pressure
• advanced medical technology
Section 2: Your Body in Flux
• exercise; healthy stress for your body
• dealing with broken bones
• heart attacks and you

## Materials You Need

The following is a list of materials necessary to complete the investigations and activities in Module 4.

### Section 1: Activity 1

- watch or clock with a sweep second hand
- bench or box roughly 45 cm high

### Section 1: Activity 2

- stethoscope
- a partner

### Section 2: Activity 1

- watch or clock with a sweep second hand
- skipping rope (optional)

## Additional Resources

*Emergency Care* 3rd edition. Harvey D. Grant et. al. Scarborough, Ontario Prentice-Hall Canada, Inc., 1982.

*Medicine's New Vision.* Howard Sochorek, National Geographic, January 1987.

*Principals of Anatomy and Physiology* 5th edition. Gerard J. Totora and Nicholas P. Anagnostakos. New York: Harper & Row, Publishers, 1987.

*Your Body in Balance* (ISIS Series) Glen Hutton. Scarborough: Globe/Modern Curriculum Press, 1989.

## Possible Media

Video series *The Human Body Series* by National Geographic (ACCESS Network)
Includes segments on the

- *Circulatory and Respiratory System*
- *Muscular and Skeletal Systems*

Video *Man: The Incredible Machine* by National Geographic (ACCESS Network)

Other possible media should be available from organizations such as C.A.M.S. – Central Alberta Media Services.

TV Series *Nova* and the *Nature of Things*

Note: Some of the suggested media may not be authorized by Alberta Education. Teachers should use their own discretion regarding the use of these resources in their classroom.

## Evaluation

The students' mark in this module can be determined by their work in the Assignment Booklet. Each student must complete all assignments. In this module the student is expected to complete two section assignments. The assignment breakdown is as follows:

| | | |
|---|---|---|
| Section 1 | = | 50 marks |
| Section 2 | = | 50 marks |
| TOTAL | = | 100 marks |

## Section 1: Medical Marvels and You

The emphasis in this section is on how medical technology is used to monitor and assess body functions and individual body systems. Students should develop an appreciation for medical science and technology and its role in preserving and enhancing their quality of life. Classroom visits by a medical technician, doctor, or nurse could be used to enhance this section.

## Section 1: Activity 1

### Investigation: Taking Your Pulse

1. In this investigation you took your pulse for a total of six trials. Why didn't you just use one trial to find your resting heart rate?

   *Performing six trials should give you a more accurate resting heart rate. A single trial may give you an inaccurate reading, either higher or lower than normal.*

2. Explain why the resting heart rate gives you a rough idea of your general fitness level.

   *Generally, the better your general fitness level the lower your heart rate. Exercise increases the muscles of the heart which means that the heart can pump more blood with each contraction. A stronger heart means a lower resting heart rate since fewer beats are needed to circulate the same amount of blood.*

3. Would you expect your resting heart rate to increase, decrease, or stay the same after three weeks of a strenuous exercise program? Explain your answer.

   *Your resting heart rate should decrease. When you exercise and get stronger, your heart also works harder and gets stronger. A stronger heart is more efficient and fewer beats per minute are needed.*

### Investigation: Your Working Heart Rate

4. Compare your initial heart rate and your recovery heart rate. Is there a difference? Explain why or why not.

   *There may or may not be a difference in your initial and recovery heart rates. If you are in good physical shape, your body should recover from the step test after two minutes. If you are not in good physical shape, your body will take longer to recover and your recovery heart rate will still be higher than your initial heart rate.*

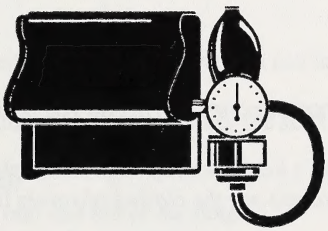
5. Did the step test cause any other changes in your body functions? Describe any changes you observed and try to explain why they occurred.

   *Strenuous exercise, such as the step test, should produce other changes in body functions. Your working muscles produce heat which must be gotten rid of. Sweating is one way of reducing body temperature. Your muscles also use oxygen when contracting so your breathing rate will increase, to obtain more oxygen for the cells of your body. If you are in poor physical condition, your body may not be able to complete the step test. Your muscles will become weak and your legs heavy, forcing you to stop before the 2 minutes are up.*

## Section 1: Activity 2

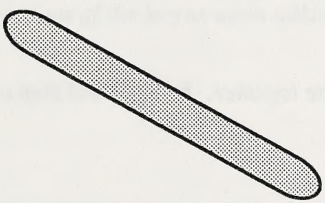
1. Match the following by placing the letter of the name and description beside the appropriate diagram.

   *e*



   a. Otoscope – used to examine the eardrum for signs of infection

   *d*



   b. Stethoscope – used to listen to heart and lung sounds

   *b*

   c. Patella hammer – used to test the reflex response of the nerves in the lower leg

*a*

d. Tongue depressor – used to examine your tonsils and throat for signs of infection

*c*

e. Sphygmomanometer – used to measure your blood pressure

2. Place your ear against the chest of another person. What do you hear?

*You should be able to hear the person's heart beating. The sound should be a muffled two-part beat, a "lub" and a "dub." These sounds are the closing of valves in different parts of the heart. You might also hear breathing.*

### Investigation: Using the Stethoscope

3. Describe what you hear.

*You should hear two sounds, fairly close together. A "lub" and then a "dub" are the sounds of the valves in your heart closing.*

4. Describe what you hear. Try to explain any differences in heart sounds.

*Your heart should be beating more rapidly and with a stronger beat. Your heartbeat should be louder after exercising for one minute.*

5. Describe what you hear.

*You should hear air rushing into the lungs when the person inhales and air rushing out of the lungs when the person exhales.*

6. Describe what you hear.

   *You should not hear anything. Blood flowing normally in your arteries does not make any sounds.*

7. Describe what you hear.

   *By constricting blood flow in the artery you should be able to hear a swishing sound. Blood flowing past the constricted area makes the sound.*

8. Briefly explain how a stethoscope works.

   *Sound is collected and amplified by the body contact piece of stethoscope. This sound is transferred to the earpieces through hollow tubing. When you have the earpieces in your ears it creates a "direct line" for sounds coming from your body.*

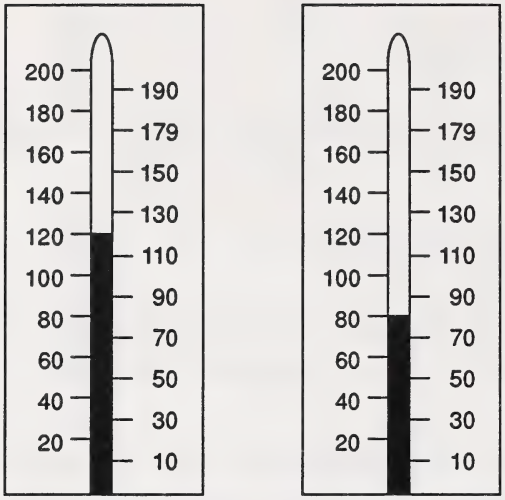
9. List three internal body sounds that you can hear when using a stethoscope.

   *Body sounds that you can hear using the stethoscope include*

   - *the heartbeat*
   - *air moving into and out of the lungs*
   - *blood flowing in the arteries*

   *You may also hear intestinal contractions (stomach rumbling), the grinding of teeth, a swallow, or the vibrations of the larynx when talking or humming.*

10. What would your blood pressure be if your doctor recorded the following readings from a mercury sphygmomanometer?




*Your blood pressure would be* $\frac{\textit{systolic (higher pressure)}}{\textit{diastolic (lower pressure)}} = \frac{120}{80}$.

11. Would a blood pressure reading of 140/90 be considered normal for an 18-year-old student? Explain why or why not.

*A blood pressure reading of 140/90 would be considered high for an 18-year-old student who is rested and relaxed. If the student were under stress or had just completed a strenuous physical workout, then the blood pressure reading may not be considered high. Normal blood pressure values are recorded when individuals are rested and relaxed.*

12. The following chart lists a number of other factors which can influence your blood pressure. Try completing the chart by explaining how you think each factor would affect your blood pressure.

| Factors | Effects on Blood Pressure |
|---|---|
| **Age** | *Arteries lose their elasticity as you grow older. Your arteries may also become constricted as fatty deposits build up on the inside walls. Both of these factors will increase blood pressure levels.* |
| **Body Mass** | *Increased body mass requires more blood and blood vessels to supply all areas with blood. The heart must work harder to circulate blood throughout the body, increasing blood pressure.* |
| **Physical Activity** | *Increased heart rates during exercise result in increased blood pressure. Exercise can, however, strengthen the heart making it more efficient. A more efficient heart will beat less often when a person is resting resulting in lower blood pressure.* |
| **Stress** | *Emotional stress or tension brings about a response similar to exercise. Your heart rate increases, muscles tense, and blood pressure increases.* |
| **Smoking** | *Chemicals in cigarette smoke are absorbed into your bloodstream. These chemicals cause a reduction in the diameter of your blood vessels, increasing blood pressure.* |

13. Bill Waters is about 20 kg overweight, smokes two packs of cigarettes per day, and is under a lot of stress at work. Give three reasons why Bill probably has high blood pressure.

    *Bill Waters probably has high blood pressure because*

    - *smoking causes a constriction of blood vessels, increasing blood pressure*
    - *extra mass requires the heart to work harder to supply all regions of his body with blood, increasing blood pressure*
    - *stress also causes his heart to work harder, increasing blood pressure*

## Section 1: Activity 3

1. Match the diagnostic test with the body system that it tests. Write the letter of the diagnostic test in the space provided in front of the appropriate body system.

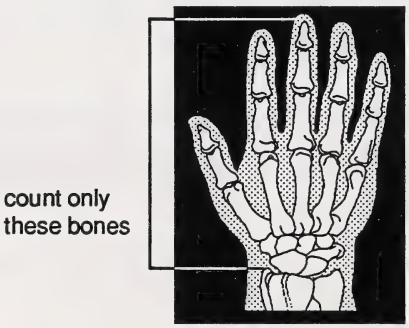
| | | | |
|---|---|---|---|
| *e* | Muscular system | *f* | Digestive system |
| *c* | Nervous system | *a* | Skeletal system |
| *b* | Circulatory system | *d* | Hormonal system |

2. How many bones are found in the palm of your hand?

   *There are five bones in the palm of your hand.*

3. How many bones make up your entire hand?

   *Your entire hand is made up of twenty-six bones.*



4. Explain the difference in structure between your thumb and the other four fingers.

   *Your thumb has two bones, one less than your other four fingers.*

5. Count the number of bones in the hand. Has this number changed?

   *No, the number of bones in the hand does not change.*

6. Are there any differences between this x-ray and the first x-ray that you looked at? Explain your answer.

   *The only difference is that the middle bone of the little finger is broken in this x-ray.*

7. Which type of scanning machine would you use to examine blood flow in the muscle tissue of the heart – CAT or PET? Explain your answer.

   *The PET scanner should be used to examine blood flow in the muscle tissue of the heart. The PET scanner will detect more radioactive material in areas with normal blood supply than in areas with restricted blood flow.*

8. Which type of scanning machine uses radioactive material to detect abnormal activity within the body?

   *The PET scanner uses radioactive material to monitor cellular activity within the body.*

## Section 1: Follow-up Activities

### Extra Help

1. Place a **T** in front of the statements that are true and an **F** in front of the statements that are false.

   *False* a. Wilhelm Röntgen invented the scanning electron microscope.

   *Wilhelm Röntgen produced the first x-ray photograph.*

   *True* b. As society's technology increases, so does the understanding of the human body.

   *True* c. A diagnostic test is done to identify or locate disease.

*False* d. An EKG is done to see if your hormonal system is working properly.

*An EKG provides your doctor with a reading of heart activity.*

*True* e. An x-ray is used to locate fractures in your skeletal system.

*True* f. An EEG is a diagnostic test used to monitor your nervous system.

*False* g. A dynamometer is a machine used to test blood flow within the heart.

*A dynamometer is used to measure muscle strength.*

*True* h. Pulse rates can be used as an indicator of your general health.

*True* i. A low pulse rate is generally an indicator of good health.

*False* j. Hypertension is a painful disorder which causes severe headaches.

*Hypertension has often been called the silent killer because it has no symptoms.*

*False* k. The sphygmomanometer is used to listen to heart and lung sounds.

*The stethoscope is used to listen to heart and lung sounds.*

## Section 2: Your Body in Flux

The emphasis in this section is on the critical interrelationships of body systems. Students are asked to complete an activity which places stress on body systems and to examine how the body deals with stress. This section also looks at skeletal injuries and heart failure. Students learn diagnostic techniques to identify these system failures and are exposed to various methods of treatment. Students should also be aware of how their own lifestyle affects their body ststems. For example, lack of exercise, smoking, and overeating can lead to high blood pressure and heart attack. This section could be enriched with a first-aid presentation from the Red Cross or St. Johns' Ambulance to demonstrate the proper method of performing Cardipulmonary Resusitation (CPR) or basic first-aid.

## Section 2: Activity 1

### Investigation: Are You Sweating?

**STEP C** **OBSERVATION**

Count the number of times you exhale (breathe out) in 1 minute. Record this value as your breathing rate.

_____ breaths per minute

Next, feel your armpit.
Does it feel warmer than usual?

✓ Yes _____ No

Are you sweating?

✓ Yes _____ No

**STEP D** **OBSERVATION**

Resting Breath Rate

= _____ breaths/minute

*Your resting breath rate should be lower, about 15-20 breaths/minute.*

1. Compare your resting breathing rate with your breathing rate immediately after exercising. Is there a difference? Explain why or why not.

   *Your breathing rate increases with exercise. As you exercise, your muscles burn fuel (glucose) and use up oxygen. Your breathing rate increases to provide more oxygen to the muscle cells.*

2. Briefly explain why you sweat after a period of vigorous exercise.

   *As you exercise, your working muscles produce heat. A certain amount of heat is necessary to maintain your body temperature, but too much heat can cause problems. Excess heat is carried by the blood to the skin's surface. Sweating is a cooling down mechanism for the body. Sweat evaporates from the surface of the skin, taking excess body heat with it.*

3. What could happen when you push your body too far, trying to go beyond your normal limits of endurance?

   *Body systems can shut down if pushed beyond normal limits. Muscles will cramp or seize up, preventing further use. You may also faint or pass out, because of a lack of oxygen being supplied to the brain. Fainting allows the lungs and circulatory system to resupply all vital organs with blood glucose (fuel) and oxygen.*

## Section 2: Activity 2

1. What steps should be taken if you suspect a person of having a broken bone?

   *First check the injured person for bluish or cold limbs, pain in the pelvis or thighs, or signs of shock (pale skin, sweating, thirstiness, or dizziness). If the person has any of these symptoms, get medical help immediately. You should also check for a lot of bruising or bleeding, crookedness of any limb, and the inability of any limb to bear weight. If the person has any of these symptoms, then you should get medical help. Otherwise, you can treat the person using RICE.*

2. Describe the home care treatment known as RICE.

   *RICE is the acronym for*

   *Rest – Do not use the injured limb.*

   *Ice – Apply ice for 20 minutes every 2 hours.*

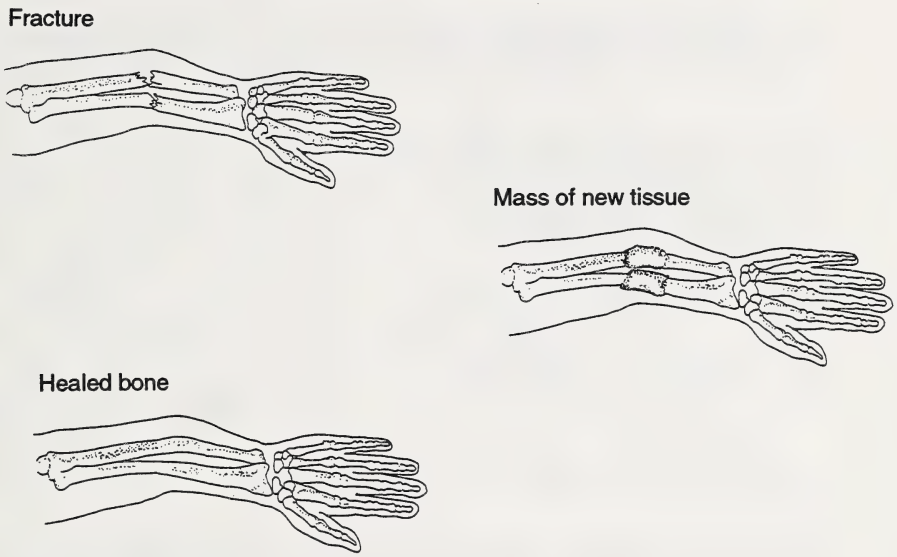
   *Compression – Wrap the injured area with a tensor bandage.*

   *Elevation – On a pillow keep the limb as high as comfortable.*

3. What type of fracture is shown in this diagram? Explain your answer.

   *This is a compound fracture. The broken bone is protruding through the surface of the skin.*

4. Has the fracture shown in the diagrams healed properly? Explain why or why not.




*No, the fracture has not healed properly. The bones should be straight, not bent at the point of the break.*

5. Ben Hurry had broken his forearm four weeks ago. The bones had been realigned and a plaster cast had been applied to the fracture. The cast peeled off about a week later while Ben was in the shower. Now his arm aches all the time and it appears to be a bit crooked. What must be done to help Ben?

*Ben's fracture has not healed properly. The doctor must rebreak the bones, realign, and set them again.*

## Section 2: Activity 3

1. Wayne Wringer, age 48, just completed a 4 km jog. He feels tired, sweaty, and complains of some pain in his chest and shoulders. He looks pale but says he will feel better after a 5 minute rest. Would you take Wayne to the hospital? Explain why or why not.

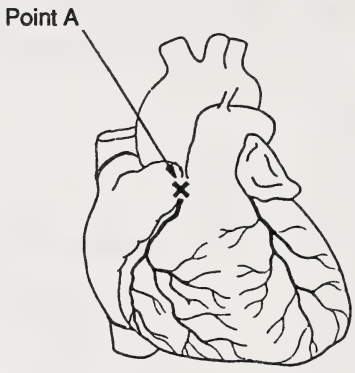
*Yes, you should get Wayne to the hospital immediately. The chest and shoulder pain, weakness, and sweaty condition all point to a heart attack.*

2. Does the heart obtain oxygen and nutrients from the blood it pumps throughout the body? Explain why or why not.

   *No, the heart does not obtain any oxygen or nutrients from the blood that it pumps throughout the body. The heart gets its nutrients and oxygen from the blood carried by the coronary arteries.*

3. A person with the heart shown on the right suffered a complete blockage at Point A. Would this blockage prove fatal to the person? Explain why or why not.

   *Yes, the heart attack would be fatal. The blockage at Point A would prevent blood from reaching the entire right side of the heart, an area too large to lose.*




4. What is the difference between a heart attack and a stroke?

   *Both heart attacks and strokes are the result of obstructions in arteries. The difference is in the location of the obstruction: blockage of coronary arteries leads to heart attacks and blocking the blood flow the brain results in a stroke.*

5. You can reduce the risk of heart attack by controlling most factors which contribute to atherosclerosis. There are, however, three factors over which you have no control. List the uncontrollable risk factors.

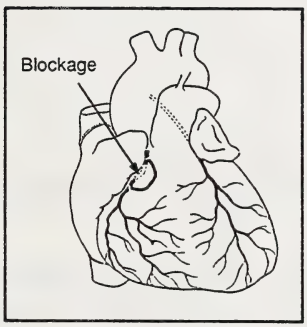
   *The three uncontrollable risk factors are*

   - *heredity – You are at greater risk of heart attack if one or more of your relatives has had heart or circulatory problems.*
   - *gender – Middle-aged men are more at risk than middle-aged women.*
   - *age – The risk of heart attack increases with age for both men and women.*

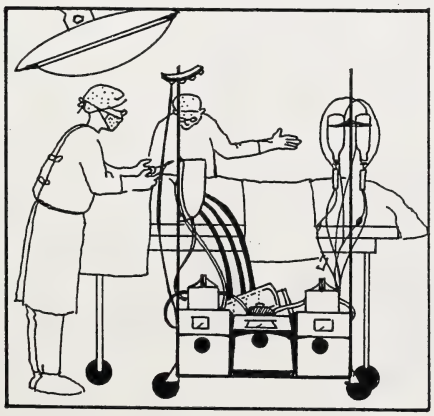
6. Match the diagrams with the descriptions of each life-saving technique or device.

*e*

*a*




*d*



a. Coronary Bypass – A new vein is used to go around a blockage.

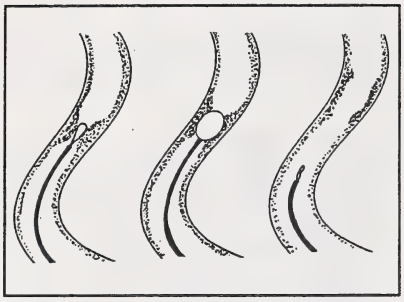
b. Balloon Angioplasty – A **catheter** with a balloon on the end is threaded through a vein to the heart. The balloon is inflated to compress the plaque against the artery wall, widening the opening for blood flow.

c. Laser Surgery – A microlaser contained in a catheter is inserted in a vein and moved to the blockage. The laser burns away the blockage.

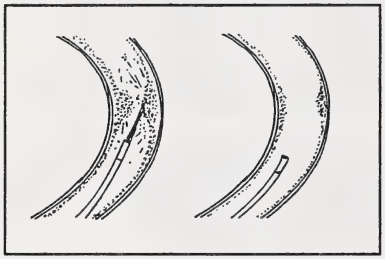
d. Heart/Lung Machine – a machine which can take over heart and lung functions for a short period of time

e. Drugs – chemicals introduced into your system to dissolve the blockage

*b*



*c*



7. Would all heart attack victims require an artificial pacemaker to continue living a normal life? Explain why or why not.

   *No, artificial pacemakers are not required by all heart attack victims. An artificial pacemaker is only needed when the heart attack damaged the cells of the heart's natural pacemaker.*

## Section 2: Follow-up Activities

### Extra Help

### Down Clues

1. any exercise or outside pressure placed on the body
2. the rate at which a person breathes
3. An individual with a broken bone is usually sweaty, thirsty, dizzy, or *pale*.
5. The C in the RICE formula stands for *compression*.

7. The area around a broken bone is often blue and purple because of ___*bruising*___.

8. removing a heart blockage by burning it with light

### Across Clues

4. Pain from a heart attack can spread to this area.

6. the number of expansions in your arteries in 1 minute

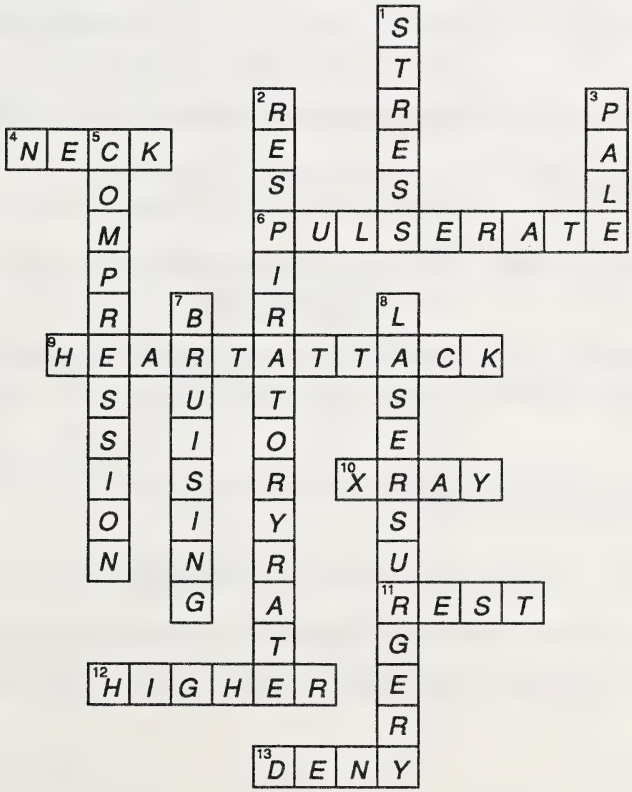
9. caused by a blockage of a coronary artery

10. required by a doctor when checking for a broken bone

11. The R in the RICE formula stands for ___*rest*___.

12. what happens to your pulse and respiratory rate when you exercise

13. what heart attack victims often do when having the attack


1 S T R E S S
2 R E S P I R A T I O N
3 P A L E
4 N E C K
5 C O M P R E S S I O N
6 P U L S E R A T E
7 B A R I A T R I C
8 L A C K S E R U S
9 H E A R T A T T A C K
10 X R A Y
11 R E S T
12 H I G H E R
13 D E N Y

## Module Summary

Having interested students make appointments with their doctors for a complete physical check-up is one way to culminate this module. Students should be able to question their physicians regarding the medical technology and the interpretation of their results.

## Key to the Assignment Booklet

### Section 1 Assignment (50 marks)

(6 marks) 1. Imagine that you are a doctor and a patient comes to your office complaining about chest pains. List two technological devices that you would use to examine the patient. Then explain what information you would gain by using each device.

*Accept any of the following:*

*Stethoscope – used to listen to the heart beat of the patient*
*A doctor could detect a weak or irregular heart beat using the stethoscope.*

*Sphygmomanometer – used to determine the blood pressure of the patient*
*Abnormal blood pressure readings would indicate that something may be wrong with the heart. More tests would be needed to determine the exact cause of the patients chest pains.*

*Electrocardiogram – used to provide a reading of heart activity*
*Irregular EKG readings may explain the cause of the patients chest pains.*

*CAT or PET Scanners – used to pinpoint abnormal tissues or regions of abnormal cellular activity within the brain*

Teacher Comment: Accept other applicable technological devises providing that it is in conjunction with an acceptable explanation of how the device works.

(9 marks) 2. Use the data provided in the chart to match each of the heart rates with one of the following people. Explain your choices.

- Robynn, a 20-year-old female in good physical condition
- Bev, a 20-year-old female who plays golf once a week and is about 4 kg overweight
- Sharon, a 20-year-old female who does not exercise and is about 20 kg overweight

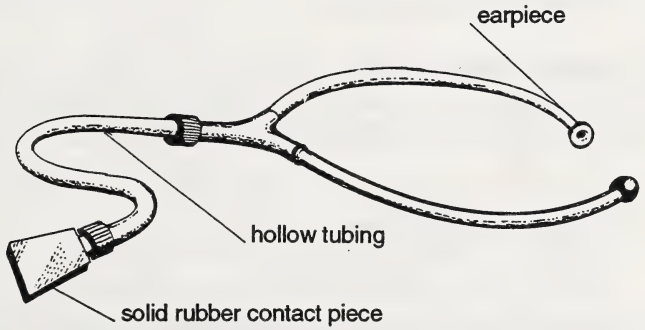
| Heart Rates (Beats/Min) | Person X | Person Y | Person Z |
|---|---|---|---|
| Resting Heart Rate | 65 | 88 | 72 |
| Working Heart Rate | 100 | 146 | 126 |
| Recovery Heart Rate | 66 | 123 | 85 |

*Person X: The low recovery heart rate indicates that Person X is in good physical condition. Robynn is in good physical condition.*

*Person Y: A lack of physical activity and excessive body mass are factors which would put more stress on the heart, resulting in a higher resting heart rate. Person Y's high recovery heart rate also indicates that this person does not exercise regularly. This person must be Sharon.*

*Person Z: The heart rates indicate that this person is in moderately good physical condition. This person must be Bev.*

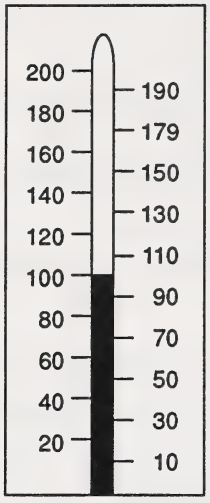
(4 marks) 3. Whitecap Medical Supply has designed a new type of stethoscope with a solid contact piece.

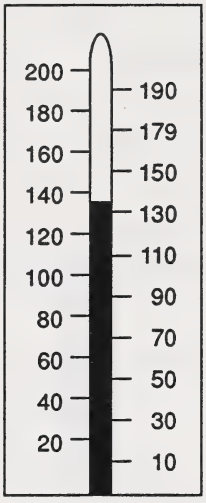



Will Whitecap's stethoscope work? Explain why or why not.

*No, Whitecap's stethoscope will not work. A stethoscope must have a body contact piece which will collect and amplify sound. The solid rubber contact piece will not collect or amplify sound.*

(6 marks) 4. Susan Antoine is a 16-year-old female in good physical condition. She recently had her blood pressure checked and was given the following illustrations of the readings from the mercury sphygmomanometer.




a. What is her systolic pressure?

*Systolic pressure = 135*

b. What is her diastolic pressure?

*Diastolic pressure = 100*

c. Is Susan's blood pressure too high for her age group? Explain why or why not?

*Yes, Susan's blood pressure is higher than the normal blood pressure for person's 15-18 years of age* $\left(\frac{110-120}{70-80}\right)$.

(4 marks) 5. High blood pressure is often called the silent killer. Explain why this statement is true.

*High blood pressure is known as the silent killer because you cannot see or feel the damage that is being done. The small blood vessels of the brain, heart, eyes, and kidneys are particularly affected by the stress and strain of high blood pressure.*

(9 marks) 6. Bill Barnum has just found out that he has high blood pressure. List three things that Bill could do to reduce his blood pressure, and explain how each would work to lower blood pressure.

*Accept any of the following:*

*Increase physical activity: Regular exercise will strengthen the heart and help to reduce body mass. The heart will become more efficient, beating less and lowering blood pressure.*

*Reduce stress: Stress causes muscles to tense and blood pressure to increase. Reducing emotional stress or tension should reduce blood pressure.*

*Reduce body mass: Excess body mass causes the heart to work harder and increases blood pressure. Dieting to eliminate or reduce excess fat will result in lower blood pressure levels.*

*Stop smoking: Chemicals in cigarette smoke cause blood vessels to constrict, increasing blood pressure. Blood pressure can be reduced by simply keeping these chemicals out of your bloodstream – by not smoking.*

*Accept any other possible answers as well.*

(2 marks) 7. What type of scanning machine uses x-rays to produce detailed images of the brain, lungs, and heart?

*Computerized Axial Tomsgrphy Scanners (or CAT scanners) use x-rays to produce detailed images of soft body tissues.*

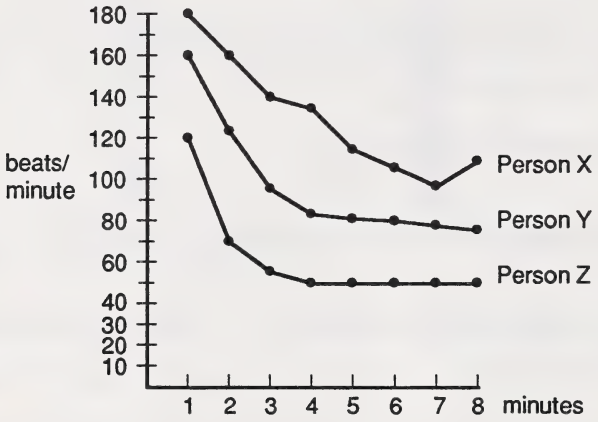
(4 marks) 8. A patient has been diagnosed as having a brain tumour close to the optic centre of the brain (the area which controls vision). To remove the tumour doctors need to know its exact location. What type of medical technology would you use to pinpoint the location of the tumour? Explain why you would choose this instrument.

*A CAT scanner or PET scanner could be used to pinpoint the location of the brain tumour. The CAT scanner uses x-rays to produce detailed images of the brain. Small differences between normal brain tissue and brain turmours are easily seen using the CAT scanner. The PET scanner uses radioactive sugar molecules to monitor the cellular activity within the brain. The cells of a brain tumour will appear quite different on the images produced by the PET scanner.*

(3 marks) 9. "Advancements in technology have led to improved diagnostic tests and imaging techniques." Is this statement true or false? Explain your answer.

*This is true. Modern technology has created devices and procedures which provide physicans with a great deal of information regarding the fitness of various body systems. X-ray machines, fluoroscopes, CAT and PET scanners, and ultrasound equipment all provide physicans with images of internal structures without the trauma of surgery.*

(3 marks) 10. Based on the information provided in the graph, determine which of the individuals probably does not exercise regularly. Explain your choice.




Minutes After 10 Minutes
of Strenuous Exercise

*Person X does not exercise reularly. This person was the slowest to recover from the 10 minutes of strenuous exercise and had the highest minimum heart rate of 100 beats/minute. Slow recovery time after strenuous exercise and a high resting heart rate are both indicators of a lack of fitness.*

## Section 2 Assignment (50 marks)

(8 marks) 1. Describe the changes that will occur in each of the following when you start to exercise. Explain why the change occurs.

a. body temperature

*Your body temperature will increase with exercise. Heat is produced by working muscles. Some of this heat is necessary to maintain a constant body temperature, but excess heat must be gotten rid of. Heat is carried by the blood to the skins surface, where it can be dissipated to the external environment.*

b. breathing rate

*Your breathing rate will increase as you exercise. Exercise increases the demands on the lungs and circulatory system to provide more oxygen to the muscles cells and to remove waste products such as carbon dioxide and lactic acid from the muscles. Your breathing rate increases to meet the demands for increased gas exchange, to take in more oxygen, and to get rid of more carbon dioxide.*

c. heart rate

*Your heart rate will increase as you exercise. The heart, like the lungs, must respond to the increased demands of the muscle cells. The heart must beat more rapidly to provide working cells with oxygen, nutrients, and to remove accumulating wastes such as carbon dioxide.*

d. sweat glands

*As you exercise, your sweat glands become more active, producing sweat to cool your body. Sweat glands produce sweat to get rid of excess body heat. The sweat will evaporate from the skin's surface, taking excess body heat with it.*

(4 marks) 2. List four symptoms which would indicate that a person has a broken bone.

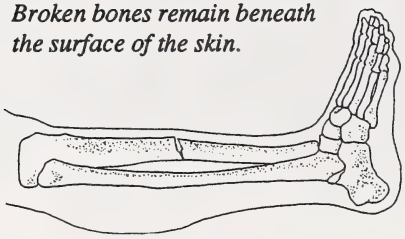
*A person with a broken bone may have the following symptoms:*

- *a crooked or fractured limb*
- *a limb which is unusable or unable to bear weight*
- *a limb which is cold or bluish in colour*
- *extreme pain in the pelvis or thigh*
- *extensive bleeding or bruising*
- *paleness, thirstiness, or dizziness*

(8 marks) 3. Draw two diagrams to show the difference between a compound fracture and a simple fracture. Make sure to label the diagrams, pointing out important differences between the two types of fractures.

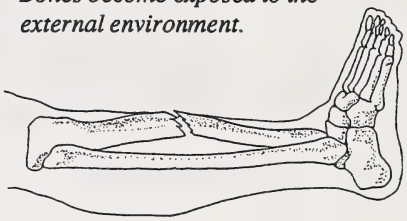
**Simple Fracture**

*Broken bones remain beneath the surface of the skin.*



**Compound Fracture**

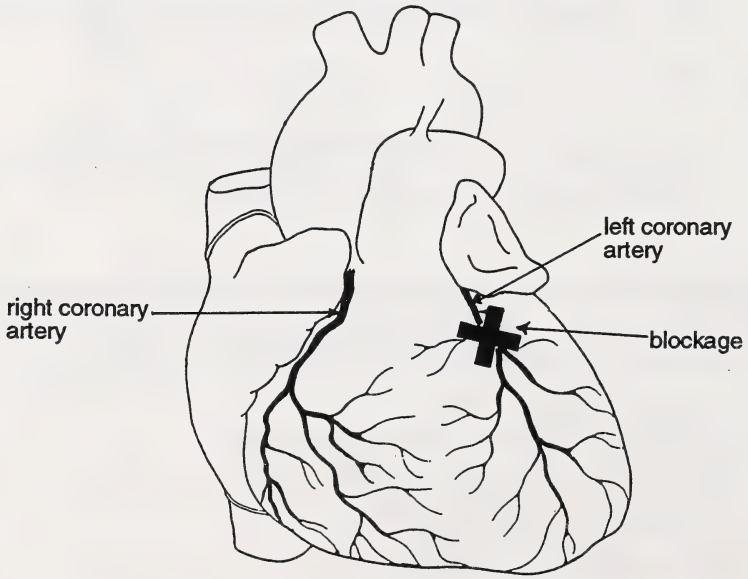
*Bones become exposed to the external environment.*



(4 marks) 4. Doctors often use plaster casts to treat patients with broken bones. Explain why a cast is needed.

*Plaster casts are used to promote the proper healing of a fracture by restricting movement, maintaining proper alignment, and preventing further damage to the fracture and surrounding muscles, nerves, and blood vessels.*

(4 marks) 5. Will the following blockage prove fatal? Explain why or why not.




*Yes, the blockage would produce a fatal heart attack. The blockage in the left coronary artery would stop the flow of blood to most of the heart muscle cells on the left side of the heart. Without a constant supply of blood the heart muscle cells will die and the heart will stop.*

(9 marks) 6. A doctor suspects that a blood clot has formed in a coronary artery, partially blocking the flow of blood. List and describe three techniques which could be used to restore normal blood flow. (You may also draw diagrams to help you explain a technique.)

Technique: *Coronary Bypass*

*A new vein can be used to go around or bypass the blockage.*

Technique: *Balloon Angioplasty*

*A catheter with a small balloon on the end can be threaded through a vein to the heart. The balloon is inflated at the blockage compressing the blockage against the artery walls and widening the opening for blood flow.*

Technique: *Laser Surgery*

*A catheter containing a microlaser is inserted in a vein and moved to the blockage in the heart. The laser can then be activated to burn away the blockage.*

Technique: *Drugs*

*Chemicals can be used to dissolve the blockage.*

(4 marks) 7. Describe four symptoms which signal a heart attack.

*Four symptomss which signal a heart attack are:*

- *a heavy, squeezing pain in the centre of the chest which can last for several minutes*
- *pain spreading to the neck, jaw, shoulders, arms, or back from the centre of the chest*
- *sweating, vomiting, shortness of breath, dizziness, or weakness*
- *denial of any illness even though the person is obviously in pain*

(4 marks) 8. Explain how atherosclerosis can lead to a stroke or angina.

*Atherosclerosis is a disease resulting from the buildup of fatty substances in arteries. This buildup reduces the diameter of arteries and provides rough surfaces which can promote the formation of blood clots. Reduced blood flow can lead to angina, heart attack, or stroke.*

(5 marks) 9. Brittany was having problems with her heart. Its beat was irregular causing her to experience attacks of extreme weakness and breathlessness.

a. What should be done to correct Brittany's heart problem?

*Brittany should have an artificial pacemaker implanted to regulate her heart beat.*

b. Explain how your treatment will work.

*The artifical pacemaker will regulate Brittany's heart beat by emitting small electric shocks at regular intervals. These electric shocks cause the atria and then the ventricles to contract at regualar intervals.*

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